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THE GAS COMPANIES AND THE ELECTRIC LIGHT.

NOTHING could be said more seriously for the injury of gas property than some of the remarks which have been made by the companies themselves. We must wait to see what Mr. Edison is ready to do before we can predict the turn of affairs which will happen. What Mr. Edison is said to have accomplished has fairly taken those who know something of this matter by surprise. Inventors are, as a rule, very cautious men, and it is an unusual thing for an inventor, who is on the threshold of a grand discovery, to exclaim, "Eureka" until he is prepared to publish the whole affair.

As Mr. Edison has not filed his complete specification, we may be sure he has not yet matured his plans. Other workers are in the field, and whilst some of them, by a vague statement, may, in their specifications, anticipate some of Mr. Edison's ideas, the fact that the invention was so overtly put forward as a secret may seriously jeopardise his position legally, should any subsequent specification be filed closely treading on his heels.

We would remind our readers of the celebrated case of Ransome *versus* Howard, where one of the parties filed, as is usually done, a specification for an invention. The other, before the six months had expired, filed a complete specification, and took out Letters Patent for what was held to be the same thing. The case was ultimately carried to the House of Lords, and although it may seem very hard against the party who was the first in the field, the ruling was against him, the decision being, that the provisional protection was intended to safeguard an inventor as against his own workpeople, and did not apply to the outside public. This should at any rate make inventors very cautious, for if an individual re-discovered Edison's secret even now, and filed his complete specification, Edison would find himself bowled out entirely.

During the past two months the road to the English Patent Office has been kept warm, not by Mr. Edison's footfalls, but by many eager and enterprising spirits, some of whom may outstrip him in success before his plans come on the scene at all.

Whatever may be the issue of what is now proposed and being tried, we may be sure that the electric light will be sooner or later a stimulating competitor to the gas companies.

Under the circumstances we consider the gas companies are not acting very wisely. At one meeting it was said that gas could be so reduced in price to the consumer as to disbar the hope of the electricians. Now, are the companies best consulting their own interest in waiting for the new light to be pronounced upon before they take action? Let our corporations and municipal authorities erect the plant for the electric light, and it will be too late for the gas companies to raise their voice on the diminished cost to the consumer, for the electric light, when the plant is brought together, will be so cheap compared with gas that the Companies, with their 2s. 6d. per 1,000 cubic feet, would be nowhere.

With regard to lighting streets, it has been said that the diminished revenue on this score to the companies would only affect that revenue by one per cent. This is manifestly an exaggeration it is probably a much more important item of, revenue. Railway stations could be most economically fitted up with the electric light. Factories and large buildings are just the places where the new light can to the very best advantage be employed; so that the only field at present apparently secure to the companies are the "side streets" and private houses.

We must, however, deal fairly with the gas companies, and if they consent to do for us what the electric light may fail to do, or at any rate as cheaply as is done with gas, are we justified in withholding from them a suitable compensation? We can hardly believe the companies would adopt such a short-sighted policy as "to take it out" of their private consumers.

That the matter is an unpleasant one for the companies there can be no doubt, and if it is a fact that the investments in this country are £130,000,000 in gas shares and stocks, we hope that the change will be transitional, even if it is to be extensively adopted.

For the sake of success in electric lighting we hope that the gas companies will not be allowed to tamper with their rival, for such a result would be to strengthen their monopoly, which, as far as gas itself is concerned, gives the gas companies what they like, and their customers what they can get.

Any attempt on the part of the gas companies to obtain Parliamentary powers over a rival system of lighting must be strongly opposed. We are glad to see that many members of the House of Commons have spoken freely on the electric light; We have, therefore, no fear that the Gas Companies will persuade our Legislation that the new method of lighting will be best carried out in their hands or that they will have any business with the light

at all, unless it be for lighting up their workshops. There are, indeed, signs that the companies recognise the hopelessness of attempting to monopolise the electric light, and are confining themselves to developing the capabilities of gas.

THE SOURCE OF SOUND IN THE TELEPHONE.

AN EXPERIMENTAL INVESTIGATION BY AID OF THE MICROPHONE.

By PROF. D. E. HUGHES.*

(*Continued from page* 455.)

PENDULUM EXPERIMENTS.—In order to verify the preceding experiments on a different system of observation, by means of which the attractions and repulsions could be rendered visible and the force estimated by its mechanical movement, the following instrument was constructed :

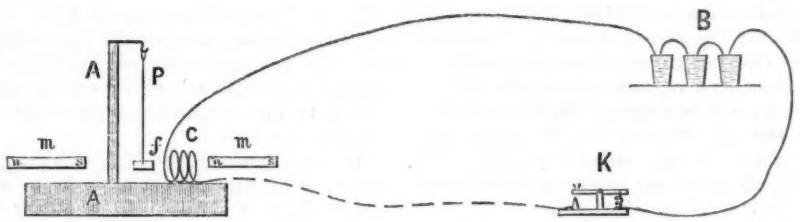


FIG. 2.

A A. Wooden stand for sustaining the pendulum wire.

P. Thin copper wire, hair, or glass thread, to sustain the piece of iron, or "bob," under observation, and by the weight of the bob and its freedom of motion to serve as the rod of the pendulum.

f. Iron, copper, or other metal bob under investigation ; the degree of continued swing being the approximate and comparative measure of the force of action upon the bob from the coil, magnet, &c.

C. Coil in communication with the three Daniell's elements. This could be shifted near or far at will by a slide.

m m. Magnets, which could be used at will to induce a magnetic field.

K. Key for closing the circuit, giving at will prolonged or momentary currents. By the introduction of a hammer and anvil microphone, undulatory currents could be used ; but as no difference was found except in the degree of force exerted, we will speak only of the maximum effect obtained in making and breaking circuit by the key.

B. Battery.

XXV.—A small rod of iron wire ½ inch long, ⅛th inch in diameter, being affixed to pendulum wire, the coil being brought within ½ inch of it, the key being opened and closed synchronously with swing of pendulum so as to sustain and increase its swing, gave but feeble results, the maximum swing being but ¼ inch. Iron bar introduced into coil improved it, giving ½ inch swing. Magnet in coil gave strong effects, but in order to measure its full effect it was necessary to remove the coil to 2 inches distance, yet even here the effect was remarkable, giving full 2 inches swing. Each closing of the circuit was marked by a strong action on the rod ; and taking into consideration the increased distance of the coil, the effect was fully twenty times as strong with the induced magnetic field as with the simple coils alone. The magnet, when removed from the coil and placed at the back of the rod, the coil thus being on the opposite side, gave feeble results, the swing being but ¾ inch. If the magnets were placed at both ends, one in the coil and the other at the back of the rod, the swing was but 1 inch ; the rod had an unstable movement as it fell under the influence of one or the other magnet. The swing was at its maximum when both magnets were placed in the coil, the similar poles being together ; it then reached 2½ inches.

XXVI.—Horse-shoe magnet or contrary poles being introduced into the coils in place of the bar magnet, the iron rod at once placed itself at right angles, and on the passage of the current through the coils, would turn on its axis slightly as a galvanometer. Notwithstanding this it commenced at once to swing, giving at its maximum 1 inch range. At first glance we should have supposed that the rod would simply have turned on its axis, but as the attraction is much stronger than the repulsion, we had here the differential results, of this action, and consequently this explains why we hear the sounds in a telephone whose magnets consists of two separate and opposing poles.

XXVII.—Copper, zinc, silver, and all non-magnetic bodies attached to the pendulum in the place of the iron show feeble repulsion where iron shows strong attraction. The swing obtained from copper, &c., was very feeble, not being more than ¼ inch at the maximum, and that only when the coil was as near as possible. No effect whatever could be obtained by the coil alone, but the introduction of the magnet at once gave evidence of the repulsions.

XXVIII.—A coil of fine covered copper wire placed on the pendulum gave no repulsions as long as the circuit of this coil was open, but on joining

* Communicated by PROF. HUGHES to the *Telegraphic Journal*. We state this because the article has been copied in a mutilated form by a contemporary.

the wires so as to form a closed circuit in which the included currents could circulate, clear repulsions were obtained.

(This proves that the movement obtained is due to the reaction of the induced currents upon the magnetic field, and as these currents are in the contrary direction to the direct or primary currents, repulsion instead of attraction takes place. This fully explains the reasons of repulsion in all the non-magnetic conductors, and also why we obtain sounds from such bodies.)

XXIX.—A coil of fine (covered) iron wire having replaced the copper coil, gave strong attractions, and but little difference could be observed when the circuit of the coil was closed or open, owing to the fact that the greatly increased swing necessitated the removal of the primary coil. In the case of the copper coil we had but one-eighth inch swing at the maximum, but with the iron coil 2 inches. (No doubt the induced current in the closed iron coil reacted upon the magnetic field tending to feeble repulsion, but the strong magnetic movement of the iron so overpowered it as to render it almost inappreciable.)

XXX.—All non-conductors gave no evidence of movement simply from want of a conducting body in which the induced currents could circulate. With copper, zinc, &c., short momentary contacts were quite as effective as prolonged ones; but with iron a very marked difference was shown in favour of prolonged contacts, thus showing that the movement was not due to any instantaneous molecular changes, but simply to electro-magnetic attractions, as we have all long since understood.

XXXI.—If we take two small bars, one of tempered steel magnetised, and the other of soft iron, both being exactly the same size, and placed alternately on the pendulum, we find that the maximum of swing is obtained with the steel bar, it giving 3 inches swing for 2 inches of soft iron. If we place in the coil a bar of soft iron similar in size to the permanent magnet, we obtain but 1 inch spring. Knowing as we do, that iron possesses far greater power as regards electro-magnetic changes under a given force than steel, the superior results obtained by the use of a steel magnet, both in the coil and on the pendulum, can only be due to a greater change in the field of force, and not to electro-magnetic molecular change in the magnet itself.

(To be continued.)

PRITCHETT'S IMPROVEMENTS IN TELEPHONES.

THE DUAL TELEPHONE.—Telephones as now generally used consist of the well-known cases held by the hand, and are applied to the ear and to the mouth for receiving and transmitting purposes. By a patent recently published, the disadvantage and uncertainty consequent upon shifting the instruments, or by using two separate instruments, is obviated. One form of instrument covered by the patent is shown by fig. 1. One end of a hinged and covered magnetised bar is fitted with a padded receiving ear-piece, and its other end is fitted with a transmitting mouth-piece. This instrument is held by one hand, and is adjusted to the ear and mouth by one motion, obviating any shifting or the necessity of having to use two telephones.

Another great advantage is that this form of instrument leaves one hand free for writing or reporting as the message arrives at the ear, whilst at the moment after the user can transmit or ask for a repetition of a message or word by means of the mouth-piece. This form, the patentee, Mr. G. E. Pritchett, F.S.A., of Bishop's Stortford, Herts., terms a dual telephone.

THE TRIPLE TELEPHONE.—Another form (fig. 2) shows a nearly similar arrangement in a triple form. It has two ear-pieces for receiving, and one mouth-piece for transmitting purposes, and is held by the handles A shown in the figure. The ear-pieces in both figs. being padded, deaden external sounds, and make the instruments, which are light and handy, very useful. Both instruments can be folded up and placed in the pocket or in a small case, and connected and disconnected at will with circuits as required.

Fig. 3 is a very handy form of instrument where it is desirable to have both hands free for writing, &c. It consists of a pair of bent magnetised and covered bars fitted with padded ear-pieces and adjusted to the ears. These ear-pieces are secured to the ears by an elastic band passing under the chin and over the head. The wires are connected up in the usual way, and brought from any convenient point or from a reel as may be desired, thus both hands of the person receiving are free, and he can report, write, and manipulate with other instruments at will. A tube is inserted above the disc for transmitting as required. It cannot fail to be seen how useful such instruments will be to gentlemen connected with the press or law courts; whilst for transmitting purposes Nos. 1 and 2 are adapted for relay, as the operator can transmit as rapidly as he receives, it being only necessary to connect up the mouth-piece with the required circuits by bringing the electric switch into use.

Fig. 4 shows Mr. Pritchett's method of capping existing telephone-cases so as to form them into multiple instruments. The caps are formed of any suitable material, and are attached to the top of the telephone. A clip at B is adjusted to fasten on to a coat collar, or a strap or button may be used to suspend the telephone. From the cap or caps a self-adjusting tube is carried up and adjusted by a pad or otherwise to the ear; or the tube may also be carried on to the other ear, and secured by an elastic band, so as to bring both ears into use for receiving. A mouth-piece is also formed in the caps for transmitting purposes, as shown at C. Thus the hands of the persons using the telephones are entirely free for writing or manipulating, as before mentioned. One telephone takes the place of two or more if desired.

Fig. 5 shows ordinary telephone cases, mounted on an adjusting stand, which can be placed on a table. Above the telephones a horizontal hollow bar is adjusted, provided with projecting pieces fitting down into the mouth of the telephones. From this bar several elastic tubes can be led off and handled, and used for receiving or transmitting purposes. For example, a number of reporters could, one and all, receive and note down "speeches" or "evidence" at the same moment,

FIG. 4.

FIG. 3.

FIG. 1.

FIG. 2.

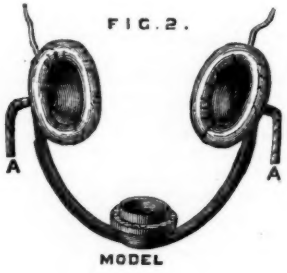
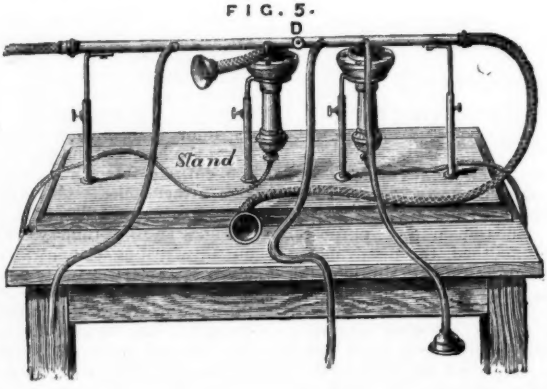


FIG. 5.



Singing, music, &c., could be heard by many persons simultaneously. By the use of a valve or damper D in the hollow bar, one or more circuits can be brought into operation, both for receiving and transmitting purposes. Many serviceable uses can be made of this appliance. The remark applies equally to the other figures. The arrangements for padding the ear-pieces must not be lost sight of, as their use deadens general sounds, and much assists the receiver. These pads are built up of layers of thin gutta percha and cloth. Compared with the telephones now in common use, the new models are certainly much more handy, and will greatly facilitate accuracy of delivery and speed in transmission.

M. TROUVÉ'S NEW ELECTRO-MEDICAL APPARATUS.*

M. TROUVÉ has recently brought before the Société de Physique two current-interrupters, answering the same purpose though based upon different principles. The first, on account of its great precision, is intended more especially for physiological researches; it gives at each second of time the number of intermissions to the one-hundredth of a second, nearly.

The second, although not rivalling the former in precision, gives the number within about one-fifteenth of a second, which is more than sufficient for medical practice and is a result often sought after.

We know how important it is in practice to be able to regulate at will the number of intermissions. Hitherto, in ordinary medical practice we have been content with apparatus furnished with a Neef trembler, by means of which it is possible to vary the number of intermissions within limits more or less wide, but without knowing the actual number.

Some physiologists, however, like Duchesne of Boulogne, foresaw the necessity of controlling the number of intermissions or successive passages of current for each second of time. Duchesne with this view arranged a pendulum whose balance marking half-seconds gave him either one interruption per second, or two, at will. The metronome and Masson wheel were also employed for the same purpose, but, as will be easily seen, the principal defects of these various systems were that they gave too restricted a field of variation, were too costly, and were not portable.

Dr. Onimus wishing to observe the influence of slow or rapid intermissions upon the movements of the heart and upon the muscular contractility in certain cases of paralysis, applied to M. Trouvé; and the following is a description of the portable apparatus they devised.

This induction apparatus (Fig. 1) consists of a primary coil independent of the secondary coils, a Trouvé "inversion" battery, various accessories for use in electro-therapeutics, and a special interrupter which is the principal part of the apparatus and forms the subject of this communication.

The interrupter (Fig. 2) is composed of a cylinder divided longitudinally into twenty parts; each section is furnished on the circumference with a certain number of stops or pegs, the number of which increases in arithmetical progression, *i.e.*, the first section has one; the second, two; the twentieth, twenty.

The cylinder is moved by a clockwork, the speed of which is regulated by a variable governor or fly, so that the desired number of turns per second can be given to the cylinder. A stylus can be shifted along the cylinder and so placed in contact with the different sets of stops, and thus the current be broken as many times as there are stops.

Suppose the stylus to occupy the first section, where there is but one stop; if the cylinder turns but once per second the current will be broken each second; and if it be made to occupy each section successively there will be 2, 3 . . . 20 interruptions per second.

Giving the cylinder a speed of 1, 2, 3, 4, 5, &c., turns per second, the number of stops will have to be multiplied by the number of turns, and thus is obtained with great precision any number of contacts from one to one hundred, and in a given time a given number of interruptions can be produced.

As during the rotation of the cylinder it would be impossible to read the divisions, and so to place the stylus at the right section, a small ivory scale, also divided into twenty parts, is placed parallel to the cylinder, and in connection with the stylus is a small pointer, which is brought over the section required to produce the number of breaks desired.

We must now explain how M. Trouvé succeeds in making the currents equal in duration, whatever the number, in a given time. This equality, in the duration of the current, is of special importance; without it one could not effect a comparison between results which varied with the variations of their sources.

For this purpose the style E (fig. 3) plays between two contacts, A B, of platinum, placed one over the other on a plate of ebonite. These contacts are put in circuit at will by means of a helical spring. It will be seen that if the upper contact B, is in the circuit, the current will be set up when the style is raised by a stop on the cylinder C, and will cease directly the stop is passed. Now, as all the stops have the same speed, and as the style and the spring D are invariable, it follows that the time of raising the style remains invariable whatever the number of contacts for each revolution. The same thing holds good for the duration of each current.

It is otherwise when the circuit is made through the contact A, for the current passes during the whole revolution of the cylinder if the style is placed over the first division, one second for example, whilst if placed over the twentieth division the duration of each current is only one-twentieth of a second. In a word, the duration varies with the number of intermissions, as is the case with ordinary interrupters. It follows from what we have said that in order to produce a succession of induced currents rigorously equal, which can only be attained with this apparatus, the circuit must be completed by contact B; if made through contact A, a constant current periodically interrupted on induced currents of variable duration may be attained.

The two binding screws, 1 and 2, are so arranged

* From *La Nature*.

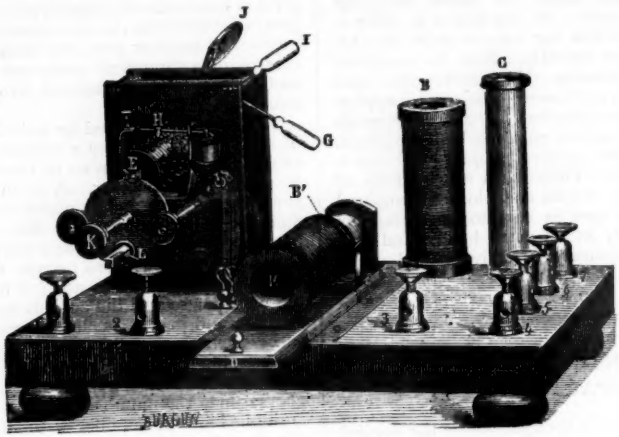


Fig. 1.

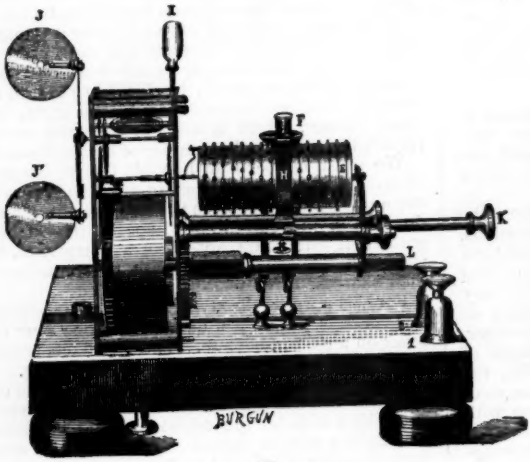


Fig. 2.

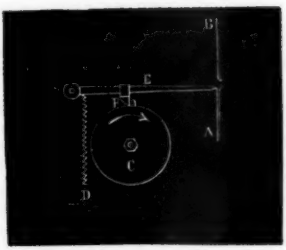


FIG. 3.

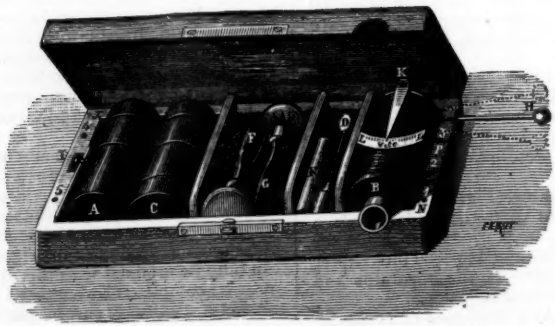


Fig. 4

as to place the patient and the interrupter in the circuit of a battery giving constant and continuous currents. It is only necessary to start the interrupter to produce the intermissions.

M. Trouvé uses this machine also to determine the proper number of vibrations to be made by the contact maker of any Ruhmkorff coil to give the maximum effect. In this case the contacts, instead of being made with the metal points A, B, are made in a mercury-cup, as in the Foucault interrupter.

If the figure (3) be examined closely it will be seen that the contacts of the style E with A, B, are sliding-contacts and are made tangentially, and that consequently the opening and closing of the current are made instantaneously and without variable pressures, conditions most favourable to the production of induced currents, and clean, well-defined muscular shocks.

The latter are obtained from terminals 5 and 6; from 6 and 7, the extra-currents; and from 5 and 7, both together. M. Trouvé wishing to endow the medical profession with an apparatus fulfilling the above conditions, but which should be within the reach of all as regards price and size, presented to the Academy of Medicine, through Professor Gararret, the apparatus we now proceed to describe (Fig. 4). The following is the note drawn up by the learned professor himself for the Academy's report, 5th June, 1877.

"M. Gararret presents, on behalf of M. Trouvé, a new induction apparatus intended for medical practice; this apparatus attains a considerable degree of perfection.

"It is highly important in therapeutics to be able to control the number of induced currents emitted. Hitherto but one machine has accomplished this end, viz., the regulator of MM. Trouvé and Onimus, which we have on a former occasion presented to the Academy. But this apparatus is very costly and can scarcely be employed elsewhere than in the physician's laboratory.

"By a very simple arrangement, M. Trouvé has constructed a regulator which enables the practitioner to vary at will and with great exactness the number of induced currents between 3 and 56 per second. This new regulator is very portable and easily handled; its price does not exceed 30 francs.

"It can also be employed in searching for bullets in gun-shot wounds. In practice, therefore, it may replace the large regulator of MM. Trouvé and Onimus, as also the electric wound-explorer of M. Trouvé, presented to the Academy in 1867."

This new apparatus is remarkable for the arrangement and simplicity of the interrupter, which in this case is of special construction, and in which its author has associated the law of the pendulum with the geometrical principle that a perpendicular is shorter than any oblique line. It comprises:—An armature mounted on a vertical pivot, on which metallic prolongations are affixed so as to considerably lessen the number of its oscillations, or to double or quadruple them, as will presently be seen.

A strip of platinum placed parallel to the armature like the usual contact spring in ordinary tremblers; this spring being in contact with the armature only at its free end, so as to bear no weight, forms with the armature the most sensitive trembler known; at the same time, the instrument is capable of bearing considerable rough usage without damage.

A vertical pivot placed a little beyond the centre of the trembler, and free to rotate on its axis half a circumference, carries at its upper extremity a needle moving over a graduated arc, and at its centre a platinum tooth, both pointing in the same direction. The latter can thus be made to occupy any desired position by being turned to the right or left. It will readily be seen that the more it is turned from a perpendicular to the trembler the greater will be the journey performed by the latter, and, consequently, the oscillations of greater duration. If it be turned parallel to the trembler no contact is made, and the apparatus is at rest. Placing the needle at the first graduation, where contact commences, the trembler armed with its lengthening pieces performs one oscillation or intermittance per second; at the second division, two oscillations, and so on, the numbers increasing until the tooth is at right angles.

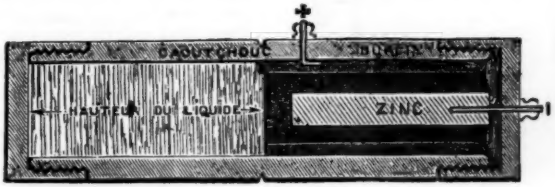


Fig. 5.

Removing the lengthening pieces, which have been adjusted to double and quadruple the time of an oscillation, the numbers shown on the arc are to be multiplied accordingly.

Intermittances of the following rates can thus be obtained: 1, 2, 3. . . . 10; 2, 4, 6. . . . 20; 4, 8, 12. . . . 40.

The figures inscribed on the graduated limb are previously determined experimentally by M. Trouvé by means of a small chronograph and registering apparatus, specially constructed for this purpose.

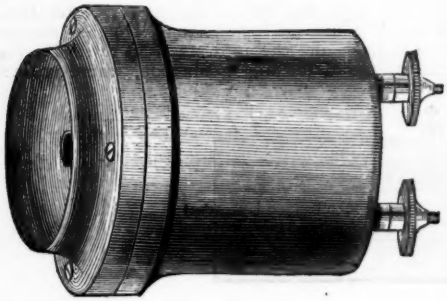
The service capable of being rendered to experimental physiology by the two sets of apparatus above described is self-evident; precision and method are imported into the application of the current; the number of intermissions necessary to produce tetanus of each muscle, stoppage of the heart, &c., can be instantaneously determined. They also enable the synchronism to be established between intermittence of currents and the normal physiological functions of the principal organs of animal life, the heart, lungs, &c., so that in cases of asphyxia the best effects may be obtained.

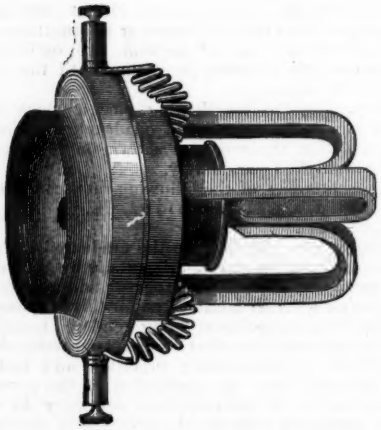
MM. Legros and Onimus, in their work entitled

Traite d'électricité Médicale, after pointing out that in certain phenomena of the heart and respiratory organs rapid intermittence is more prejudicial than intensity of current, suggest that if the happy idea of Hallé and Sue, of placing electrical apparatus at stations for the assistance of the drowned were carried out, apparatus of the nature of those here described should be employed; for by limiting the number of possible intermittences, they could be employed without danger even by unskilled hands.

HICKLEY'S TELEPHONE.

IN the TELEGRAPHIC JOURNAL for October 1, we illustrated the American "Crown Telephone" of Mr. Phelps; a form which appears to have been independently and priorly invented in England by Mr. Hickley, a mechanician. From the accompanying diagrams it will be seen that the principle is th



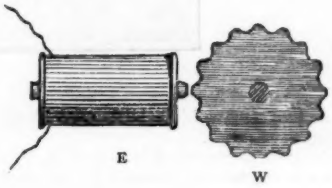


same in both of these instruments. Phelp's being a double form of Hickley's, one set of the like poles of the magnets centres on the soft iron pole piece being inserted in the coil and the other set connected to the soft iron diaphragm. The articulation is strong and distinct, although the instrument is small, as will be seen from the figures which are full-size. Larger forms are also sold. Messrs. M. Jackson and Co., Manufacturers of Scientific Apparatus, Barbican, are the sellers of Hickley's Patent Telephone.

THE PHONIC WHEEL OF M. PAUL DE LA COUR.

THE most simple form of the phonic wheel is that shown by the figure. It consists of a toothed wheel of soft iron turning around an axis, so that the teeth pass very close, but without touching, to the pole of an electro-magnet. If a phono-electric current—that is, a current of which the force is a periodic function of time—is caused to pass through the electro-magnet, so that the pole exerts a periodic series of attractions on the tooth nearest to it, then the wheel will be in stable equilibrium not only when it is at rest, but also *when it turns at certain definite speeds*. This is particularly the case when one magnetic pulse succeeds the foregoing one in the time that the circumference of the wheel has turned a distance equal to one tooth.

If a series of pulsations, obtained by means of a tuning-fork provided with a make and break arrangement on one of its prongs, be caused to pass through the electro-magnet E and the wheel W be set in motion, then, as soon as the rate of this rotation becomes such that a tooth passes the pole of the magnet at each



pulsation, the motion will continue, and will be uniform as long as the pulsations pass through the magnet.

If the wheel, whilst in a state of motion, has a tendency given it to accelerate or retard its motion, such, for instance, as would be given it by a weight attached to a cord wound round its axle, then if this retarding or accelerating force does not exceed a certain limit, the rate of rotation will not be altered. The reason of this is that when the wheel tends to be accelerated in its motion, the teeth tend to pass beyond the pole of the magnet at the moment a pulsation is being transmitted through the latter, but when this is the case a direct backward pull will be exerted on the teeth as they pass beyond the pole, and so the acceleration is retarded and the speed continued uniform. If the force acting on the wheel is such as to retard its motion, then the action of the magnet will evidently be such as to give a direct forward pull to each tooth. M. Paul la Cour has succeeded in causing a phonic wheel to maintain its uniform rate of rotation when acted upon by an accelerating or retarding force of one

kilogramme-metre-minute. This property of the phonic wheel would render it useful for several purposes. Thus, by means of such a wheel, the synchronous uniform motion of clockwork trains, such as is required for astronomical purposes, and also for several forms of telegraphic apparatus, could be obtained with great facility.

By attaching a phonic wheel to an indicator, which would enable its rate of rotation to be ascertained, and by providing any sonorous body, whose rate of vibration is required, with a contact arrangement in circuit with the electro magnet of the wheel and a battery, the rate at which this body vibrates can evidently be readily ascertained.

Besides the regular motion—that is, the motion when one tooth passes the pole of the magnet for each magnetic pulsation—the phonic wheel will turn with a uniform motion at certain other rates; thus it will keep in uniform motion when the velocity is such that one tooth passes the pole of the magnet for every two magnetic pulsations. Again, the uniform motion may be obtained when the rate of rotation is $\frac{2}{3}$, $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$ that of the regular motion. The power of the wheel to resist external forces is not so great under such conditions as it is in the case of regular motion. The case is the same if the rate of rotation is greater than the regular motion.

ELECTRIC LIGHTING.

GAS *versus* STEAM ENGINES.—It is significant of the set which public opinion has now taken on the subject of gas *v.* electric lighting, that the Gas Light and Coke Company have decided to apply to Parliament, merely for powers to enable the Company to supply gas and apparatus for heating, cooking, ventilating and other purposes, and not for powers to adopt the electric light. The fact may be taken as an indication that the gas companies have come to the conclusion that the electric light, though taking the larger illumination out of their hands, will not seriously affect the vast and more remunerative field of domestic lighting; and that therefore they need not strain themselves to take up the electric light, but will be more profitably occupied in developing the resources of gas now in their possession, so as to better its quality, and extend its sphere of usefulness, even to the point of making it minister to the electric light itself. That the Chartered Gas Company has not taken this course without first studying the question was evident, from the exhibition of the Siemens' electric light, driven by a gas engine, which took place recently at the Company's Offices, Horseferry Road, Westminster. One object of this exhibition was evidently to display the advantages of the gas engine as a motor for dynamo-electric machines over the steam engine. Mr. Sugg, the well-known gas engineer, there pointed out that whereas it took an hour to get up steam in a steam engine, in the gas engine the power was obtained as soon as the gas was turned on. In the case of a sudden fog, therefore, or on any occasion when the light was required for a short time only, the gas engine would be suitable but the steam engine would not. The gas engine further possesses the advantage of accomodating itself to any variation in the external resistance, whereas the governor of a steam engine is too slow for such a purpose in relation to the electric light. In using the gas engine for lighting a large space such as Billingsgate Market, Mr. Sugg proposed to have five 8 horse-power engines, each of which would drive two dynamo-electric machines, placed at any convenient distance apart not exceeding 300 yards, the engine being in the middle. But as no attempt is here made to subdivide the current, we must consider Mr. Sugg's scheme as of very little real value, except from the gas maker's point of view. As to the cost of electric lighting by the Otto silent gas engine, Mr. Sugg stated that the gas consumed, if burned in suitable Argand burners, would yield a light equivalent to 1600 sperm candles, whereas the two electric lights obtained therefrom by Siemens' system would amount to from 3000 to 4000 sperm candles; but as the latter had to be reduced from 50 to 60 per cent, by glass shades, the effective light in both cases was about the same. Now, the Siemens' machine employed to give this light would cost £70, and the two Siemens' lamps £40, while the 8 horse-power gas engine would cost £260, making a total of £370. The carbons would cost 1d. per inch, and consume at the rate of four inches per hour per lamp. one attendant would suffice. Mr. Sugg then showed his visitors a comparison between the electric light and a 200 candle gas burner, from which he deduced that the electric light was three or four times as expensive, a result strongly at variance with other data.

EDISON'S LIGHT.—According to the *Times* New York correspondent, Edison subdivides the electric light by a main outgoing and returning wire of large size, connected by branch circuits, in which the lamps are placed. He means to find out the defects of this plan by a practical trial on a large scale at Menlo Park, and he is now fitting up two 80 horse-power steam engines, machines, and lamps for the lighting of that village. His chief secret, however, is in the lamp, and the light can be turned up or down like gas. He is not positive as to the cost, but is confident it will be cheaper than gas in the United States, by from 2.25 to 4 dollars per 1,000 feet.

SAWYER'S LIGHT.—Mr. Sawyer's domestic carbon light is enclosed in glass tubes 7 inch high and 1¼ inch bulbous at the top, and filled with nitrogen and other gases. The carbon is 1 inch long by 1-16th inch diameter, held between thick carbon bars. The carbon is heated to 50,000° Fah., (?) and the heat generated within the tube is carried off by a thick coil of metal to a copper plate, and thence radiated into the air. The heat of the tube, however, only makes it feel warm to the touch. The mode of distribution is the same as Edison's, and the flow of the current is regulated by a secret appliance. Each lamp is equal to four gas jets or (in New York) to 75 candles. The resistance of his carbon burner is much greater than a platinum one, and Mr. Sawyer does not think he can light more than 30 lamps with a 4 horse-power generating machine. The light has been taken up by the Electro-Dynamic Light Company of New York, and a public trial is forthcoming, the Hockhausen machine, which is said to be a trifle more powerful than the Wallace-Farmer, is to be used. The 30 lamps will produce a light equal to 2,925 candles, at an expense of 35 cents an hour as compared with 1.68 dollars for the same in gaslight. Mr. Sawyer claims that his carbons are indestructible, and that one of his lamps has been lit for a month. The light can be moderated at will from a feeble glow to six times the intensity of the ordinary gas jet. A suitable current meter has been devised.

COST OF THE JABLOCHKOFF CANDLE.—Messrs. Wells & Co., have published the following details of the cost of their mode of lighting by Jablochkoff's candle in London. There are at present three kinds of dynamo-electric machines used with this process, viz., the four-light, six-light, and sixteen to twenty-light Gramme.

These machines can be driven by an expenditure of one horse-power per light; and the maintenance of an Otto gas engine for this purpose would be from 1d. to 1½d. per horse-power per hour, attendance not included. For a four-light machine the estimate is as follows (exclusive of brackets) :—

	£	s.	d.
Price of machine in London	180	0	0
Price of each lamp with globe, sockets, &c.	10	0	0
Insulated leading wire, per yard	0	2	0
A four horse-power (nominal) steam-engine with boiler, exclusive of shaft and fixing, about	140	0	0
A four horse-power gas-engine	175	0	0

Probably the whole cost of providing a four-light apparatus, including engines, brackets, and the services of a skilled engineer for a short time, to give intructions in its use, would amount to about £400; but a special estimate is in all cases necessary. The cost of the candles is 8d. each (lasting one and a half hours) or 5½d. per hour. In calculating the total cost of the light as compared with gaslight, an allowance for interest on capital, and about 10 per cent. for depreciation, must be made, but it is obvious that a similar allowance for depreciation should be made in respect to gas fittings.

COST OF THE WERDERMANN LIGHTS.—From a two horse-power Gramme machine Mr. Werdermann obtains a light of 320 candle power from a rod carbon 4 millimetres thick. This light can, we believe, be installed for £75. Each carbon can be procured a yard long, costs one franc, and will last from 12 to 15 hours.

Correspondence.

SOURCE OF SOUND IN THE TELEPHONE.

To the Editor of THE TELEGRAPHIC JOURNAL.

SIR,—I have seen with pleasure in the last number of your Journal that Mr. Fleeming Jenkin is of the same opinion with myself on the theory of the telephone, and that he has shown, as I have also done, that the effects produced in this marvellous instrument are much more complex than was believed at first, and that he maintains this in spite of the most evident proofs of certain *savants* who keep always to the classic science of the commencement of the century, and who do not believe it to be susceptible of progress.

I must remark, however, that Mr. Fleeming Jenkin, in speaking of *two* voices being heard in the telephone, that of the magnet being the feeblest, reasons as if the two effects were distinct, and not the result of effects of magnetic increase determined at the end of the magnet by the action of the diaphragm. These effects of increase are considerable since the magnetic force increases and multiplies itself. For the most feeble sounds from the bar magnet take place when it acts alone, and they are most strong if they can be heard separately from those of the diaphragm.

As to the sounds from the diaphragm itself, I have always believed that although they may result from the effects of magnetization and demagnetization, determined by the magnetic variations of the magnet, they may equally result from attractive effects at the moment these effects are produced, which evidently take place when voltaic currents are employed; but I have always believed, and still believe, that with the feeble currents which are produced in the ordinary Bell telephones, these attractive effects are *nil*, and the sounds produced are due to an effect analogous to that which takes place in the magnet itself. The sounds produced by the wire on the bobbins, which Mr. Fleeming Jenkin considers as added to those in question, have been already pointed out by M. Rosseti, and considered by M. Luvini to add to the reproduction of the sounds in the telephone. M. Luvini has even given them as completing my theory, and I am glad to see that Mr. Fleeming Jenkin still further agrees with us upon this question.

As to the fourth source of sound that this *savant* has observed, I agree entirely with him, although I have not made any experiments in this direction, but his reasons appear rational.

Accept, Sir, the assurances, etc.,

M. DU MONCEL.

Paris, Nov. 10, 1878.

To the Editor of THE TELEGRAPHIC JOURNAL.

SIR,—Will you allow me to correct your otherwise accurate notice of my case which appeared in the last number of your journal. You state that Sir William Thomson and Professor Fleeming Jenkin tried my telegraph instruments, and that *after* I expressed my "dissatisfaction with this trial, alleging that the referees did not keep to the terms agreed upon, a further trial was *suggested by Mr. Jenkin*." This is an error. The letter of reference set forth "that any fault of detail was to be reported to me to give me an opportunity of overcoming it before a final report was made." Hence what followed, which I will extract from a letter sent by my solicitors to the Post Office, but which has never received any attention :—

"On 26th July, 1872, Professor Jenkin made a preliminary report addressed to both parties to the reference, which contains this passage :—

"'It is very desirable that an automatic Wheatstone's sender should be arranged to send slips with actual messages, so that they may be recorded by Mr. Herring's instrument. No trials can be quite satisfactory which do not exclude the imperfections of sending.'

"We find among the papers in this case the following minute :—

"'Nov. 18, 1872. Write to Mr. Fleeming Jenkin with reference to his preliminary report on Mr. Herring's telegraph instrument, and request to be informed whether he is still of opinion that the department should make, at its own cost, an automatic sender for the purpose of further testing Mr. Herring's instrument. F. I. S.'

"We also find that Professor Jenkin wrote to Mr. Scudamore as follows :

"'In answer to your letter of the 18th, I beg leave to say that I think it unnecessary that an automatic sender should be made by the department unless the officers of the department think it desirable.'

"This letter of Professor Jenkin is manifestly inconsistent with the rules which govern the conduct of referees, and with the ordinary principles of justice, and it is necessarily fatal to the assumption of 'a full and fair trial' which you would draw from the names of the referees. It comes to this, that one of the referees writes to one of the parties to the reference to inquire whether that party thinks it 'desirable' that a step should be taken which the referee had previously declared 'very desirable' for a satsfactory trial. In effect, the referee applies to one of the parties for directions as to the method of proceeding in the reference.

"A reference thus conducted would be an absurdity, and its result must be nugatory, and accordingly we find that Mr. Scudamore was sensible at the time that something more would be necessary to a satisfactory trial.

"On 19th December, 1872—

"'Mr. Scudamore promised that if Mr. Herring wished a further trial of the instrument after Messrs. Thomson and Jenkin had made their report he would give his consent.'

"We have before us Mr. Herring's memorandum of his interview with Mr. Scudamore on that day, and Mr. Scudamore's letter of the next day, admitting that that memorandum 'is accurate as far as it goes.'"

From this point the department has habitually broken its promises. It has never asked the referees to meet, although it induced me to engage and to pay two eminent scientific men to meet Sir William Thomson and Mr. Jenkin at the proposed trial. It obtained possession of my instruments, however, by a written assurance that it intended to proceed with the trial. It has never assigned any reason for thus acting, nor has it replied to my application to be reimbursed for the consequent loss of my time and money. It has even neglected to deal with my petition for redress, although such petition has been referred to it by the Sovereign.

I am, Sir, your obedient servant,
RICHARD HERRING.

27, St. Mary's Road, Canonbury,
November 10th, 1878.

To the Editor of THE TELEGRAPHIC JOURNAL.

SIR,—In your issue of 1st inst., Mr. Fahie observes "the values of A and B were wrongly given on page 86, as 39 and 1461, instead of 40·78 and 1459·22. Taking these figures it will be seen that

$$\frac{A}{B} = \frac{33{\cdot}33}{1192{\cdot}83} = \frac{40{\cdot}78}{1459{\cdot}22}$$

the error here is therefore only apparent."

Now

$$\frac{33}{1192{\cdot}83} = 0{\cdot}0279 = \frac{40{\cdot}78}{1459{\cdot}22}$$

and the error is *only apparent*, but

$$\frac{39}{1461} = 0{\cdot}0266,$$

and therefore that discrepancy which I pointed out, although slight, did exist.

I am glad to find from Mr. Fahie's explanation that he was quite correct about the "strength of the *signal*," which I confused with the "strength of the *current*." It It is a pity Mr. Fahie did not show by figures how his results were obtained. To be strictly correct, the total resistance in circuit in such instance must be taken into consideration. With A and B = 39 and 1461 respectively, which values are more convenient for calculation, it will be found that (1) when both keys are at rest currents through each relay may be represented by 138.

(2) When one key is depressed

Current through relay of same station = 136
" " " other " = 83

(3) When both keys are depressed

Current through each relay = 80.

Mr. Fahie declares that duplex working would be impossible if the current in the home relay were reduced where the key is depressed. This is not the case, for it is only necessary to adjust the relay, so that this current shall not work it, but that any still weaker current shall.

I am, Sir, yours truly,
H. A. W. FANSHAWE.

16th November, 1878.

Notes.

THE TELEPHONE.—M. Bosscha, a German physicist, finds that the plate of a Bell telephone has a bodily motion under the influence of the sonorous currents, a result which agrees with that obtained by the research of Prof. Hughes, which we give on another page. M. Bosscha measures the displacement of the centre of the plate to be 34·3 thousands of a millimetre for a current of one weber strength. The least displacement of the plate which is capable of yielding audible sounds is 2·5 thousands of a millimetre or about $\frac{1}{100}$ of the wave length of yellow light.

EDISON'S carbon telephone was recently tried between London and Norwich on a circuit very noisy with the induced currents from busy lines alongside; but conversation was carried on successfully when the voice was lowered a little below the ordinary tone.

EDISON states that he has invented a non-magnetic telephone receiver which gives out sounds as loud as the original ones or even louder.

Apropos of the announcement that Edison's carbon telephone had been recently tried successfully over a line 750 miles long, Mr. A. Scott states in the *Times* that Mr. Willoughby Smith obtained distinct results with Bell's telephone through a resistance equivalent to 125,000 miles of telegraph line. This is an interesting fact in itself, but laboratory resistance should not be compared in this way with actual telegraph lines.

THE Microphone has been successfully employed as a thief-catcher by an Indian officer, who suspected some of his coolies of oil stealing. A microphone among the oil jars enabled him by a telephone to hear the marauder at work, and to capture him in the act of filching the oil.

WE have seen and heard a receiving microphone belonging to Prof. Hughes which gives very striking effects. The voice heard from it is so natural and like the speaker's, that we at first believed we were overhearing the speaker, until assured of the contrary by withdrawing the little instrument from the ear. The peculiar timbre of telephone plates is entirely absent from its tones. This microphone was a hammer and anvil form *made of pointed pieces of crystalline coke* and fixed on the diaphragm of a small tambour.

THE ELECTRIC LIGHT.—We have received the prospectus of the British Electric Light Company, Limited, formed for the purpose of supplying the electric light as an illuminator or for applying electricity for other purposes. The capital is £100,000, divided into 10,000 shares of £10 each, and the liability of shareholders is limited to the amount of their shares. The first issue will consist of 4,000 shares, and it is not intended to offer the shares to the general public. The first object of the Company is to acquire an exclusive license for the United Kingdom, under Gramme's patent, for producing electric currents, and an arrangement will be made for the purpose with Messrs. Ball & Co., Limited (the sole agents for Grammes' machines hitherto in England). The first outlay of the company will comprise the purchase money for the license (exclusive of a royalty on each machine), and the compensation to Ball & Co., for relinquishing their agency, making a total of £14,250. To this sum must be added the legal and

other expenses necessary for the formation of a company. Among the names associated with this company we notice Mr. E. J. Reed, C.B., Mr. Latimer Clark, and Sir Charles Bright. The electrical engineer is M. Radcliffe Ward, and the London office is in Broadway Chambers.

WE have also received the prospectus of the National Electric Light Corporation, Limited. The primary object of this Company is to supply the Rapieff Electric Light. The capital is £500,000 divided into 50,000 shares of £10 each, and the first issue will consist of 25,000 shares. The liability of shareholders is limited to the amount of their shares. The Company intend working the patents of M. John Rapieff, and any improvements thereon, or other inventions for a like purpose, and they also include other applications of electricity besides lighting, within their scope. According to the contracts entered into, M. Rapieff has received from the Company £25,000 and 5,000 fully paid-up shares for his patent. Mr. A. J. Otway, M.P., director of the Submarine Telegraph Company, is Chairman of the Board of Directors, and Mr. E. J. Reed, C.B., will join the board on his return from Japan. The manager is Mr. Applegarth, C.E., and the electricians are M. John Rapieff, and M. Alexander Lineff, *assistant*.

THE SUN ELECTRIC LIGHT COMPANY have acquired several patents, one of which is for a flexible carbon wick, the advantage of which is that a length of it can be stowed in the lamp and manipulated like an ordinary wick.

A REGULAR course of telegraphic engineering studies has been established this session at University College, London.

THE Telegraphic Museum, established by M. Stephan, the director of German telegraphs, has been opened to the public in Berlin. It is comprised in two large halls of the General Post Office there.

DIVISIBILITY OF THE ELECTRIC LIGHT.—In a series of communications to our contemporary, *Engineering*, Professor S. P. Thomson, of Bristol, deduces from dynamical principles, "that any system of subdividing the light by branching the circuit, is disastrous from an economical point of view: because, when the external resistance of the circuit is thus diminished, the increased relative amount of unavoidable internal resistance causes a waste of energy which more than balances the 'dynamic economy' of having in the arc so large a percentage of rays which can affect the eye." This waste of energy takes the form of heat within the battery or other source. Experiments on the resistance of the larger electric arcs, given by Lontin, Rapieff, and Werdermann's systems, with currents of different strengths from dynamo-electric machines, together with estimates of the relative intensities of the light, are at present a great desideratum. The results of Professors Ayrton and Perry are an interesting contribution to this subject, but they were obtained by the use of a battery, not a dynamo-machine, and their chief merit lies in pointing out that the larger researches we have indicated are required.

THE Liverpool Corporation have decided to apply to Parliament next Session, for powers to light Liverpool and other places within their rule, by means of electricity. They also desire the right of taking over the works of the existing gas companies, and extending the supply of gas for gas engines and cooking purposes.

THE central transept of the Crystal Palace is being lighted by the Sun Electric Light Company. A small Gramme machine, driven by a 12 horse-power semi-portable Ruston and Proctor steam engine, is employed to yield the current; and the lamps are to be on Harrison's plan.

THE Liverpool Street Railway Station is to be lighted by Wallace-Farmer electric lights, each enclosed in clear glass globes, and elevated 20 feet above the platforms. When the electric light is well elevated, it should be provided with a reflector to throw the radiance down, otherwise much of it is lost in the upper air.

THE Alexandra Dock Company of New Port, South Wales, have decided to use the electric light to illuminate part of their docks, in order to carry on their coal shipments with greater ease by night.

AT the Royal Academy on November 21, Professor Barff lectured on the kinds of light best suited to the lighting of studios and picture galleries. He illustrated his lecture with the electric light, in whose favour he decided.

AN Electric Light Company, to produce light, heat, and power, has been formed in New York, with a capital of 300,000 dollars. Mr. Edison is one of the promotors.

FOOTBALL matches and political speeches, by electric light, continue to come off; and many different kinds of manufactories are being provided with it. The large tobacco factory of Messrs. Cope Bros. and Co., Liverpool, has been lit by Jablochkoff's candles. In his speech at the celebration of the event, Mr. Maccabe (another theatrical manager who has been attracted by the electric light) rather aptly said, that what the public wanted was to get electric candles at the same price as ordinary dips, and to light them up as easily. It is in the cigar room where several hundred females are employed making cigars, that the chief advantage of the light will be felt. It will render the room brighter and cooler, and make it possible to select the tobacco leaves according to their varieties of shade and fineness.

THE long-expected trial of Jablochkoff's system at Billingsgate has come off, and some of the fish dealers were disappointed with it. A greater effect would have been obtained by having more lamps than 16 to replace 700 gas jets.

IT is said that Sir William Armstrong and Co., at their Elswick Works, Newcastle, are making a large engine for use in connection with the Edison electric light. Sir William has also lit his picture gallery at Craigside, his estate near Newcastle-on-Tyne, by a Siemens' lamp. The current is obtained from a Siemens' machine and turbine, placed at the source of power, a waterfall one and a half miles from the house. Generated at the fall, the current is conveyed all that distance in an underground cable, and it has been found necessary to employ a return wire. By means of an electric motor, Sir William also intends to apply the electric energy to sundry domestic purposes.

THE famous engineer, M. Krupp, has introduced an electric lamp of his own construction at his steel works, Essen, in Prussia. The regularity of the current is maintained by a fan revolving in mercury, and the carbons are arranged vertically one over the other.

The light is said to be one-third cheaper than gas light, which there costs about the same as it does here.

ONE of the ingenious notions which seem to enrich even the commonest talk of Mr. Edison, is that of having hand electric lights which can be moved about, the current being conveyed to the wick along wires enclosed in a flexible cord. In this electric cresset there will be neither oil nor dripping, but probably tripping.

WE are somewhat surprised that the gas critics of the electric light have not put forward the belief that the wire for the electric lights will be a source of danger to the community by "attracting" lightning strokes into every house. Nor does it seem to have occurred to electricians themselves that some kind of domestic lightning protector may be necessary to guard the circuits. Current meters and lightning protectors are subsidiary inventions which will be required.

A NOTABLE suggestion is made by "Photophilus" in the *Photographic News*. It is to light the reading-room, and, perhaps also the library, of the British museum by the electric light. Owing to the destructive effects of oil and gas lighting on books, and the danger of fire, the reading-room is not opened after dark, thus preventing students from using the library after their working hours in winter, the reading season. It appears to us that Mr. Werdermann's system is well adapted for the purpose. Until Mr. Edison's plan is publicly exhibited there may be a certain reluctance to take up other systems, although Mr. Werdermann's is well suited to light both the British Museum and the Albert Hall.

DIFFUSING LIGHT BY STEAM.—The powers of condensed steam for diffusing light by reflection and emission after absorption, are well seen in the case of clouds and locomotives, and Herr Brandau, of Berlin, has patented a means of using it for artificial lighting. The steam passes through a glass globe exposed to the beams of the light source and diffuses a uniform brightness. As a reflector for the electric light, this may prove useful. The white cloth reflector employed by Messrs. Siemens' Bros., answers the same purpose.

PROF. S. P. THOMSON will lecture on the Electric Light, before the working men of Bristol, on December 13. Over 2,600 people attended his former lecture in the Colston Hall there. A fine opportunity for making a brilliant hit by lecturing on the subject awaits some of our electric expositors in London. Will not Prof. Tyndall, or Mr. W. H. Preece, or Prof. Barrett, favour us with a Royal Institution or South Kensington address on this important subject early this winter? There has been no dearth of electric sensations of late; but it must be admitted that the electric light is the most splendid of all the themes which Electricity can put into the hands of the scientific lecturer.

THE following poetical trill is from the *Journal of Gas Lighting*:—

> "Pity the poor deluded,
> On share-selling madly bent,
> Laugh at the dupes denuded
> Of interest 10 per cent.
> Envy the fortunate buyers,
> Free from panic and fright;
> Honour the bold defiers
> Of Blinding Electric Light."

Our versatile poet asks us in the same breath "to pity," and "to laugh" at the deluded shareholders. We are more inclined to keep these emotions for the bard himself.

THE GLOW-WORMS AND THE FIRE-FLIES—A FABLE.—Once upon a time there was a colony of glow-worms who lived in a very dark wood; and the other small denizens of the wood, finding that they had such excellent lamps in their tails, were only too happy to let them form into a company to light up the recesses of the grove at night, and to pay them for their light. Only the night-hunting moth and the blind mole objected to such a course, so the glow-worms united themselves into a corporation and waxed fat on the taxes they levied for their light. But as they waxed fat, they found it more and more trouble to keep their tail-lights bright; nor did they wish to, for they were paid whether their lights were good or bad, and if a poor grub complained that he could hardly see to dig, they would straightway cut off his light altogether. At length this oppression became very irksome to the community, and one day a grasshopper, who managed a company of performing ants, and required a good light for his theatre, brought over a fire-fly from a neighbouring garden and placed him in the midst of the lazy glow-worms. The brilliant light of the fire-fly quite cast the dingy glow-worms into the shade; but these bloated maggots only shrugged their shoulders, and said, "That's only one—and see how bright it is, it will blind you all," then went to sleep again. Nevertheless, more and more fire-flies came to the wood from the garden, and the glow-worms began to quicken up and get afraid that after all there might be something dangerous to them in these new lights. Things were in this state, when, one fine day, a gad-fly, an arrant gossip, and post-boy to the grove, suddenly brought the news that the "Great American Lightning Bug" was coming. The effect was indeed electrical—one half of the frightened glow-worms scampered off as fast as their legs would carry them, and the other half turned over on their backs and grew sick. But time passed and the Lightning Bug did not appear, so the glow-worms gradually took heart again and those that had run away came back, while those that had turned ill recovered their dignity, and all of them boasted as before. The gad-fly was denounced as a rogue, and the Lightning Bug was proved to be only a large Hum Bug, but for all that the fire-flies continue to arrive faster than ever, and the gad-fly swears that the Lightning Bug is on his way.—*Will o' the Wisp.*

SUBMARINE QUADRUPLEX.—Dr. Alexander Muirhead, together with Mr. G. Kift Winter, the inventor of the closed circuit duplex system in use in India, and Mr. J. A Briggs, have invented improvements in duplex and quadruplex telegraphy, whereby the latter system can be applied to submarine cables. The patent description was communicated from Madras, where Dr. Muirhead recently sojourned while duplexing the Madras to Penang Cable.

SUBMARINE DUPLEX.—In reply to communication to the *Times* by Mr. Herring, Sir James Anderson states the Eastern Telegraph Company are now working Muirhead's duplex system on the Marseilles-Malta section (825 miles) at the rate of 26 words per minute, whereas by simplex they only attain 15 words per minute. The increase of speed on all the sections from Malta to Bombay is at least 70 per cent. With regard to land lines, Sir James says that on the company's line between London and Porthcurnow, a distance of 320 miles, as many as 54 words per minute can be sent as against 25 by simplex.

PROF. GRAHAM BELL is in America seeing to his patent case there.

MR. L. SCHWENDLER has returned to India.

THE INTERNATIONAL AGENCY OF ELECTRICITY.—We are glad to learn that this project approaches realisation. Count Hallez d'Arros now announces that the scheme has been well received by the French and foreign press, and that a great number of constructors have offered to put their apparatus in the electrical museum to be formed. We have already avowed our goodwill to the project, and our wish to further it, and we should like to see some of our electrical makers assist in the enterprise. It will probably be with the *Agence Internationale de l'électricité* as with other things, when it has shown that it can achieve success unaided, it will receive plenty of support from abroad. Let it first establish a French nucleus and foreign aid will gravitate to it.

IN the list of subjects set by the Institution of Civil Engineers for prize essays during next session, (1878—79) we observe the following: "Recent progress in telegraphy, with a notice of the theoretical and practical data on which that progress has been based;" "The application of electricity to lighting purposes, contrasted with the best systems of lighting at present in use;" and "The relative advantages of steam, heated air, gas, water, and electricity as the motive power in small engines."

AT the Society of Arts, John Street, Adelphi, a paper on "Electric Lighting" will be read by Mr. Shoolbred. The third course of Cantor lectures will be delivered by Mr. W. H. Preece, on "Recent Advances in Telegraphy," the first lecture being given in April, 1879.

WE hear that the Edison-Preece microphonic affair is to be brought before the Chicago Electrical Society with a view to its being cleared up.

ON an after January 1st, 1879, each word of a telegram between England and Germany will cost 30 pf., without any restrictions as to number of words, route, or locality.

THE Western Union Telegraph Company is again meeting with active rivalry in the Eastern States. The Central Union Telegraph is extending its Oswego and Syracuse line to New York, and is about to combine with the Continental Telegraph, which proposes to push out to the West as soon as possible. The tariff which the latter have adopted between New York and Philadelphia is 15 cents per message, although the charge over the Atlantic and Pacific line is only 10 cents. Notwithstanding this discrepancy, the Continental line is as busy as it can be, and three wires more are being erected.

OVERHEAD wires are to be abolished in Philadelphia and underground wires are to be adopted. Experiments have been made at the National Tube Works, McKeesport, with the patent insulated core of Mr. H. Alberger, which we noted on June 1st. Alberger's cable is formed by enclosing a copper conductor in a glass tube within an iron tube, and heating the whole to red heat. The combination is then passed between rollers, which solidify it without crushing it. The core is made in 10ft. lengths, with convex ends, so that in jointing the pieces the conductors will first touch. The iron exterior will be enamelled before being laid for the sake of durability. It will be seen from our list that this core has just been patented in England.

New Patents.

4528. "Telephony." H. J. HADDAN (communicated by G. Black and A. M. Rosebrugh). Dated Nov. 8.

4529. "Improvements in telephones and telephonic call mechanisms." H. J. HADDAN (communicated by A. M. Rosebrugh). Dated Nov. 8.

4553. "An improved mode of manufacturing carbons for electrical purposes." M. GRAY. Dated Nov. 9.

4559. "Improvements in the arrangement of mechanism to be employed in connection with apparatus for producing light and heat by means of electricity." C. DAVIS. Dated Nov. 11.

4568. "Electric light apparatus." J. MACKENZIE. Dated Nov. 11.

4573. "Improvements in apparatus chiefly designed for the electro-deposition of metals and the production of light by electricity." G. ZANNI. Dated Nov. 11.

4575. "Means or apparatus for electric lighting." H. W. TYLER. Dated Nov. 12.

4590. "Duplex and quadruplex telegraphy." J. Muirhead, Junr. (communicated by A. Muirhead, J. A. Briggs, and G. K. Winter). Dated Nov. 12.

4595. "Improved means and apparatus for generating electric currents and an improved electric lamp." C. F. HEINRICHS. Dated Nov. 13.

4601. "Improvements in telegraph cables, and an improved mode of manufacturing the same, parts of which improvements are applicable to other purposes." B. HUNT (communicated by M. H. Alberger and S. W. Pett). Dated Nov. 13.

4611. "Methods of an apparatus for producing electric light, heat, or motive power, by means of electricity." E. EDWARDS and A. NORMANDY. Dated Nov. 13.

4626. "Improvements in the means or apparatus for obtaining light by electricity, and distributing, regulating, and measuring the electric currents for the same." St. G. L. FOX. Dated Nov. 14.

4635. "Apparatus for dividing and distributing electric currents for lighting and other purposes." E. J. C. WELCH. Dated Nov. 15.

4645. "Improved means for obtaining electric light." J. S. LELLAR, W. LADD, H. EDMUNDS.

4646. "Electric lamps." J. S. LELLAR, W. LADD, H. EDMUNDS.

4662. "Improvements in producing the electric light and in lamps applicable to that and other sources of illumination." J. T. SPRAGUE. Dated Nov. 16.

4671. "Production, regulation, and distribution of electric and electro-calcic lights." W. L. SCOTT. Dated Nov. 18.

4686. "Improved means of transmitting electricity to great distances." E. U. PAROD. Dated Nov. 19.

4689. "Apparatus for producing the electric light." E. J. C. WELCH. Dated Nov. 19.

4690. "Improvements relating to electric regulators, lamps, or candles." J. H. JOHNSTON (communicated by A. de Méritens). Dated Nov. 19.

4693. "Dividing the electric light and apparatus therefor." A. RIEMENSCHNEIDER, F. S. CHRISTENSEN. Dated Nov. 19.

4696. "Electric telegraph insulators." C. E. CRIGHTON. Dated Nov. 19.

4705. "An improved method or system of distributing, dividing, regulating, controlling, and

measuring electric currents, in the practical application of the same to electric lighting and other useful purposes." J. F. CHEESBROUGH (communicated by W. E. Sawyer, and A. Man). Dated Nov. 19.

ABSTRACTS OF PUBLISHED SPECIFICATIONS.

656. "Lamp Signals." A. M. SILBER. Dated February 16, 1878. 2d. This consists in forming a lantern by which the light can be shrouded or displayed at will, by closing or opening hinged doors. *Void because complete specification not filed.*

717. "Electric Lamp." R. A. KIPLING. Dated February 21, 1878. 6d. This consists in forming an electric lamp of four carbons, two meeting at their points at one level, and two others also meeting at their points at a somewhat higher level, and crossing the lower pair at right angles. It will be seen that this lamp is similar to Rapieff's. For supplying fresh carbons, as those in the lamp become wasted, the casing containing each may be made like the cylinder of a revolver, having its chambers charged with carbons, a new carbon being brought into line as the old burns down. Tubular carbons are preferred as giving a more powerful arc.

719. "Galvanic Cells or Batteries" WILLIAM SPARKES WILSON. Dated February 21. 6d. This consists in forming cells of three compartments, the inner one containing the positive pole carbon, the mid one containing nitrate of soda, binoxide of manganese, &c., and the outer containing the negative element, zinc. A solution of sulphuric acid is employed as the liquid. Lumps of chalk are also placed in the outer compartment.

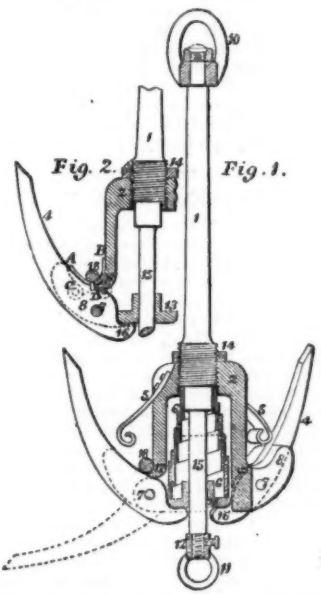
759. "Telegraph Cables." F. LAMBERT. Dated February 23, 1878. 6d. This consists in protecting cables from toredo ravages or rusting, by sheathing it in the material called mineral wool, slag wool, or silicate cotton, with a suitable agglutinating material such as pitch, tar, oils, india-rubber, &c., capable of resisting the action of water. The protection is applied either as an outer coating, or as a tape wound spirally round the core, or as serving in lieu of the ordinary hemp serving.

767. "Covering Telegraph Wires, &c." HENRY CONRADI (communicated by R. Wiebe, Wolgaste, Russia). Dated February 25, 1878. 2d. This consists in insulating wires, with a covering made from india-rubber or caoutchouc, dissolved by throwing bisulphuret of carbon ($C S_2$) over it, and is prepared in bottles with large necks, tightly stopped. The metals are sponged with this solution, and an hour after, they are sponged repeatedly with a second solution. This solution is made by taking gutta-percha, wool, tar, and rosin, and pouring bisulphuret of carbon over it, then mixing the result with the first india-rubber solution in the proportion of 4 to 1; then adding more bisulphuret of carbon. *Not proceeded with.*

Proceedings of Societies.

THE SOCIETY OF TELEGRAPH ENGINEERS.

AT the ordinary general meeting of this Society, Nov. 16th, Mr. ANDREW JAMIESON, C.E., read a Paper on "Cable Grappling and Cable Lifting." After reviewing the various kinds of accidents which produce faults in submarine cables, and classifying them into faults by abrasion, anchors, teredo, deterioration of core, and lightning, Mr. Jamieson described the process of grappling and lifting cables. He pointed out that the present mode of stoppering a cable when it has been raised up to the bows on the grapnel is unsatisfactory: a man having to be lowered to cut it with a saw: and also suggested that improvements might be made in lighting mark buoys. At present these buoys are lit by a lamp attached to the pole of the buoy by a boat's crew, a clumsy, and in rough weather, a dangerous mode. Captain Collison's buoy, which is lit by gas compressed to 10 atmospheres within the buoy itself, has been recently tried during gales at sea; and had kept alight for twenty-two days and nights; the light being visible four miles by the glass, and two by the naked eye. This buoy, Mr. Jamieson thought, was worthy of trial. It may be mentioned that in the discussion which followed the paper, Mr. W. H. Preece related that he had seen a buoy off Sandy Hook which compressed air as it rose and sank on the swell, and gave out a powerful whistle. Mr. Jamieson then came to the subject of grapnels, and after describing the ordinary grapnel, the centipede and Lambert grapnels, he gave a detailed account of the grapnel with hinged flukes, invented by himself and Mr. W. F. King. The



special advantage of this grapnel is that in moving over the bottom should the prongs or flukes encounter a rock, they will not be broken off as in the case of the ordinary and centipede grapnels, but will bend backward until they relieve themselves from the obstruction, when the grapnel is freed. On the other hand, should the cable be caught it will fall into the hollow between the stem and shorter flukes, where it will be retained. The figure represents a section through this form of grapnel, where 1 is the stem and 10 is the shackle; 2 is a hollow cast iron box, containing a stout spiral spring 6; 4, 4, are the moveable flukes, long and pointed, turning round pivots 7, 7; 8, 8 are the shorter flukes which retain the cable 18, when it is caught, although the longer flukes 4, 4, may be bent back. The flukes 4, 4,

are prevented from going back too far by a knuckle 16 on their inner ends. The springs 5, 5, are designed to help in retaining the cable on the shorter flukes, but we believe that in the newest forms of the instrument their use has been abandoned as unnecessary. The stem is screwed into the boss and jammed by the nut 14. By means of the ring and screw 11 and 12, a weight or drag chain can be attached to the bottom of the grapnel. A moveable washer or piston 13, caps the lower end of the spiral spring and acts as a buffer for it; the knuckles 16, on the inner ends of the flukes 4, 4, pressing on the buffer as they turn inwards, while the flukes are being bent outwards by the rock. As soon as the flukes have been turned sufficiently far back to escape the impediment, the force of the spring throws the flukes into their original position with respect to the stem. In figure 2 also, A and B are the blades of shears turning round fulcrum C and D, so that when the cable presses upon them the blades close on it and sever it. Mr. Jamieson does not fit these shears to the grapnel ordinarily, and in his communication to the society of Telegraphic Engineers, he did not describe them; but if successful in their operation, there are cases of cable grappling in which they might be serviceable. The merit claimed for Jamieson's grapnel is that it saves the expense of renewing the broken flukes of centipede grapnels. Sir Charles Bright, in the discussion which followed the paper, enquired of Mr. Jamieson its price as compared with the centipede grapnel. Mr. Jamieson replied that his grapnel cost £50, whereas the centipede cost from £10 to £15. Jamieson's grapnel has been successfully tried in practice both on the Brazilian and on the Eastern Telegraph Company's Cables.

PHYSICAL SOCIETY.

AT the meeting on Saturday the 9th November, Prof. G. C. FOSTER, Vice-President, and afterwards Prof. W. G. ADAMS, President, in the Chair.

The following candidate was elected a member of the society:—Sir Frederick Elliot.

Prof. W. G. ADAMS explained a simple appliance made by Mr. S. C. Tisley, for exhibiting the coloured bands due to interference with thick plates. The bands due to regular reflection and refraction were produced by two thick plates nearly parallel to each other, and fixed in a brass box with rectangular apertures on its flat faces so that the light fell on the first plate at an angle of 60°. The elliptical interference bands due to the scattering or diffusion of light at a point on the front surface of one of the plates, were shown by means of a precisely analogous arrangement, except that the inclinations of the plates to each other was somewhat greater; in this case, the interference bands formed by *regular* reflection and refraction fall in another direction, so that they are not received by the eye. Prof. Adams pointed out that this instrument would form a convenient means of obtaining polarized light in cases where the length of a Nicol's prism is objectionable.

Prof. BARRETT described and exhibited Edison's Micro-tasimeter, which we illustrated in our last number.

The carbon telephone, described in our issue of April 15th of this year, was then shewn, and its principle described. Prof. Barrett stated that according to Prescott's work on "The Telephone," the carbon telephone had been used successfully on the same wire, conveying quadruplex messages, and his own experience of the carbon telephone enabled him to state that the instrument worked, though feebly, when the line wire was broken, the fractured ends being near to but not touching each other. No other telegraphic instrument he had tried was able to transmit through such a circuit.

Mr. ADAMS, the assistant of Mr. Edison, was present at the Physical Society's meeting, and exhibited a complete transmitting apparatus, with call, &c.; and when he spoke to the carbon telephone in a distant part of the building, exclamations were audible to the entire meeting.

Mr. Edison has also recently invented a new form of receiver, more delicate than that employed in these experiments. No magnet is employed, and the volume of sound is largely increased.

M. LADD afterwards showed several forms of electric lamps, arranged so as to render clockwork unnecessary.

AT the ordinary general meeting of the society on Saturday, Nov. 23, Professor W. E. AYRTON read a Paper by himself and Prof. Perry, on "The music of Colour and Visible Motion." Prof. Ayrton, after alluding to the fact that in Japan and China the art of posturing and dumb show is cultivated to a high degree, producing emotions in the native auditors, which it fails to do in the Europeans, and seems to take the place there which our opera does here, went on to say that he believed that in the far distant future the western nations would cultivate this hitherto neglected side of their æsthetical natures, and develope a new emotional art. It was well known that moving bodies and changing colours produce an emotional effect on spectators. The eastern nations had cultivated this to a high degree, but the western nations had cultivated the emotional art of music instead. Professors Perry and Ayrton, in order to inaugurate a science of this new art had invented a machine which gave changing harmonic motions to a visible body, and varied the colours of the background against which it was seen. A drawing of this machine was exhibited. It consisted of a revolving barrel curiously cut so as to give certain movements to levers, which actuated the visible body. They claimed that this was the first machine of its kind, the first musical instrument of the new emotional art. A variety of such instruments could be designed to give a variety of effects; and it might be possible for a whole city to watch the fleeting display projected upon the clouds above them or upon a screen.

Dr. SCHUSTER also described his new method for adjusting the collimator of a spectroscope for parallel rays of different refrangibility, by looking through the telescope and turning the prism round. When only one focus is observed the collimator is properly adjusted.

General Science Columns.

THE ELEMENTS NOT ELEMENTARY.—Mr. Norman Lockyer, reasoning on the results of a long series of comparisons of the spectra of different elements, has arrived at the conclusion that the elements are really composite bodies. This has long been suspected by chemists, but Mr. Lockyer believes that he has proved it. His opinion is that all the elements are composed of one elementary substance—hydrogen—under different degrees of concentration. Thus the nebulæ being intensely hot, are formed solely of hydrogen, the sun being a body middling cool, contains many varieties of "elements," and the earth, a mass cooler still, contains a greater number of different materials still. Mr. Lockyer will shortly communicate his alleged discovery to the Royal Society.

"PHILLIPPIUM" is the name given to a new metal whose oxide was discovered by M. Delafontaine. It has been discovered in the mineral gadolinite, in which the reported new metal mosandrum was found. It will be remembered that M. Delafontaine questioned the existence of mosandrum, and judged it to be terbium. The same chemist has discovered another metal, which he calls "decipium," in North Carolinian Amarskite.

"KERITE," a kind of artificial caoutchouc, is the invention of Mr. Day of New York, and is made as follows:—To produce 100 parts by weight of Kerite, 27 parts of cotton oil, and 30 parts of oil-tar are heated together in a cauldron for several hours, at a temperature of about 150° C. After this has been done, 30 parts of linseed oil, 12 parts of sulphur, and 5 of ordinary wax or of solid paraffine are added. The whole is then heated for five or six hours, at a temperature under 150° C. to prevent carbonisation. It is then allowed to cool, and is moulded into blocks convenient for future purposes. The price is about one-third of the natural caoutchouc. Mr. Day received honourable mention for Kerite insulated telegraph core, exhibited at the Paris Exhibition.

IT is proposed to make Paris a seaport town by deepening the Seine from the sea upwards; and it is calculated that, if no extraordinary difficulties are encountered, the bed of that river could be sufficiently deepened in four or five years to allow vessels of 800 tons to get as far as the capital. This alteration, says *Engineering*, would allow the French to compete with foreign coal.

AN ALLOTROPIC MODIFICATION OF COPPER.—M. Schutzenberger communicates the following facts in evidence of an allotropic form of copper yielded by electrolysis of certain copper solution. He took an electrolysing bath, made of a solution of one hundred parts of acetate of copper in ten of water, and boiled for some minutes to expel acetic acid and render it slightly basic. The battery employed was two Bunsen or three Daniell elements, of medium size, so as to avoid all elevation of temperature in the bath. The negative electrode platinum is placed parallel to the positive electrode copper in the bath, at a distance of from three to four centimetres. The dimensions of the platinum electrode should be a little less than those of the copper. In these circumstances the face of the platinum electrode is covered with a layer of allotropic copper, whilst the copper electrode opposite receives a much thinner deposit of ordinary copper. If the negative electrode is notably thicker than the positive, the modified copper deposit is placed opposite the latter, and is encased with ordinary copper. In this way can be obtained simultaneously, and side by side, two kinds of copper, which by their characteristics are quite distinct. The allotropic copper takes the form of plates with a metallic lustre, a roughened surface on the free side, and a polished surface on the side next the platinum plate. If the operation is sufficiently prolonged, it forms at the inferior angles and at the borders of the negative electrode some beautiful arborescences, directed towards the positive plate, whose branches, ramifying like those of a tree, sometimes attain a length of several centimetres before they break off by their own weight. The allotropic copper is less red than the ordinary, and approaches the colour of certain bronzes. The plates are easily detached from the negative electrode after being washed with boiling water and dried in a vacuum at the ordinary temperature. They are broken up, entirely deprived of malleability, and reduced to an impalpable powder, like sulphur, by braying them in an agate mortar. The density of this form of copper has not yet been exactly measured, it being always mixed with from five to ten per cent. of oxide, of which the origin is explained by the extreme oxidisability of the allotropic copper. The specific gravity is, however, very near'y 8 or 8·2, while that of ordinary copper is 6·9.

The plates washed with boiling water and exposed moist to the air, oxidise on the surface very rapidly, acquiring beautiful tints, and after a few minutes taking a deep indigo blue colour. In ærated water at 50° or 60° C., and in a cold solution of basic acetate of copper, the oxidation is instantaneous; and the electrolysis of a bath of basic acetate only furnishes at the beginning some deposits very rich in oxide; it is only at the end of a certain time when the bath has become almost neutral, that the operation goes on regularly.

Allotropic copper exposed to the contact of the air as a dry powder and at ordinary temperature, becomes black at the end of a short time, and changes into copper oxide, soluble in cold dilute sulphuric acid.

The way in which it behaves in pure nitric acid, diluted with six times its weight in cold water, is characteristic. Its surface, if it be oxidised, soon brightens, and then the metal is immediately attacked with disengagement of nitric protoxide almost pure, covering itself at the same time with a coating of olive black, of which the composition is as yet undetermined. Ordinary copper is hardly attacked at all by azotic acid, diluted 10 per cent., and with more concentrated acid, the nitric bioxide is chiefly given off, but without the blackening of the metal. Plates are sometimes obtained which give, on dissolution, a dilute nitric acid, mixtures of protoxide and bioxide ($\frac{3}{4}$ to $\frac{2}{3}$ N^2 O for $\frac{1}{4}$ to $\frac{1}{3}$ N O); it is easy to make sure that they are formed of a mixture of the two coppers. This effect takes place when the bath is warmed during electrolysis, or if it is acid. Allotropic copper is converted into ordinary copper by the action of heat in prolonged contact with a dilute solution of sulphuric acid. On one occasion, M. Schutzenberger found a considerable mass of allotropic copper in a powdery state and dried in a vacuum, to become suddenly transformed into ordinary copper, with a notable disengagement of heat at the instant of its return into the air. Incipient oxidation might be a determining cause of the phenomenon, but it cannot explain the notable discharge of heat, for the metallic aspect of the powder had not changed, and analysis did not reveal much more oxygen after than before (about 1 per cent).

Heated to 100° C. in the vacuum or carbonic acid the allotropic copper does not give off hydrogen. The difference of physical properties ought not therefore to be attributed to the presence of a hydrate of copper or occluded hydrogen, and is only to be explained by the existence of a special modification of the copper, susceptible of being oxidised cold, and yielding bioxide of copper, and of dissolving and blackening in very dilute nitric acid. It is probable that this modification corresponds to the copper of cupric salts. In changing into ordinary copper it gives out heat, and furnishes by oxidation cuprous oxide before passing to the state of cupric oxide.

INDIA-RUBBER.—On the upper as well as the lower waters of the Amazon, there is a growing dearth of rubber, owing to the pernicious system of trading introduced by the Para rubber merchants, and also to the ill-treatment of the ceringa trees by the collectors. The

credit system, fostered by the merchants, makes the Indians improvident, and dishonest Indians neglect their engagements. The rubber supply is consequently deficient and inferior, and the trees too severely drained of juice. The Brazilian Government are, however, about to correct this abuse.

CHEAP LIGHT.—A Master of Arts, Cambridge, informs us that he witnessed recently at Brighton a dial rendered luminous by a phosphorescent substance, which absorbed the sunlight and emitted it again after the departure of the orb of day. "May we not," he asks, "expect to see, on this principle, a luminous dial over every door in London?" There is here no question as in the case of electricity *v.* gas, of the comparative cost, the solar rays shining, as Perdita says, on all alike. I am reminded of a saying of the Roman philosopher, Pliny the younger—"*Mihi multum cogitanti persuasit Natura nihil incredibile esse existimem de illa.*" These luminous dials are probably an application of Balmain's patent, No. 4152, 1877, for luminous paints. Luminous house numbers would be a small but serviceable application of the process, which we would suggest to Mr. Balmain. Another is luminous backs for public seats in parks, &c., thus obviating Dr. Lacomme's electrical apparatus for the same end. This mode of illumination is in a state of very feeble infancy; but what with the advance of chemistry and physics, we do not know how important it may become. We may be yet enabled to store the elusive radiant energy of solar and electric light or heat just as we can now store up chemical, mechanical, and electrical energy.

LIGHTNING ROD CONFERENCE.

IN response to an invitation issued by the Meteorological Society, a Lightning Rod Conference will be held shortly under the presidency of Mr. C. Brooke, F.R.S. The following gentlemen have been nominated as delegates by the several societies, viz.:—

ROYAL INSTITUTE OF BRITISH ARCHITECTS.—J. Whichcord, Esq., F.S.A., Vice-President; Prof. Lewis, F.S.A.

SOCIETY OF TELEGRAPH ENGINEERS.—J. Latimer Clark, Esq., M.I.C.E., Past President; W. H. Preece, Esq., M.I.C.E., Vice-President.

PHYSICAL SOCIETY.—Prof. W. G. Adams, F.R.S., President; Prof. G. Carey Foster, F.R.S., Past President.

METEOROLOGICAL SOCIETY.—C. Brooke, Esq., F.R.S., Past President; E. E. Dymond, Esq.; G. J. Symons, Esq., F.R.S., Secretary.

The Secretary to the Conference will be Mr. G. J. Symons.

On November 15th, the Western and Brazilian Telegraph Company notified that telegraphic communication by cable had been restored between Bahia and Rio de Janeiro.

The Great Northern Telegraph Company also gave notification on the 14th inst. of the repair of their cable between Nagasaki and Shanghai, messages being again received for all stations in China as well as Japan.

The following are the late quotations of telegraphs:—Anglo-American, Limited, 59½-60; Ditto, Preferred, 85½-86½; Ditto, Deferred, 34½-35½; Black Sea, Limited, 2-3; Brazilian Submarine, Limited, 6⅜-6⅝; Cuba, Limited, 8-8½; Cuba, Limited, 10 per cent. Preference, 15½-15¾; Direct Spanish, Limited, 2-2⅛; Direct Spanish, 10 per cent. Preference, 9¾-10¼; Direct United States Cable, Limited, 1877, 12⅜-12⅝; Eastern, Limited, 7⅜-7⅞; Eastern, 6 per cent. Debentures repayable October, 1883, 103-106; Eastern 5 per cent. Debentures repayable August, 1887, 99-101; Eastern, 6 per cent. Preference, 10⅞-11⅛; Eastern Extension, Australasian and China Limited, 7-7⅛; Eastern Extension, 6 per cent. Debenture, repayable February, 1891, 104-107; German Union Telegraph and Trust, 8-8⅛; Globe Telegraph and Trust, Limited, 4⅛-5⅛; Globe, 6 per cent. Preference, 10¼-10½; Great Northern, 7⅞-8⅛; Indo-European, Limited, 20-21; Mediterranean Extension, Limited, 2¾-3; Mediterranean Extension, 8 per cent. Preference, 8¾-9⅛; Reuter's, Limited, 9⅛-10⅛; Submarine, 215-220; Submarine Scrip, 1⅝-2; West India and Panama, Limited, 1⅝-2; Ditto, 6 per cent. First Preference, 7⅞-8⅛; Ditto, ditto, Second Preference, 7½-8; Western and Brazilian, Limited, 2½-3; Ditto, 6 per cent. Debentures "A," 90-94, Ditto, ditto, ditto, "B," 84-88; Western Union of U.S. 7 per cent., 1 Mortgage (Building) Bonds; 114-118; Ditto, 6 per cent. Sterling Bonds, 100-102; Telegraph Construction and Maintenance, Limited, 29½-30½; Ditto, 6 per cent. Bonds, 100-103; Ditto, Second Bonus Trust Certificates, 2½-3; India Rubber Co., 29-30.

TRAFFIC RECEIPTS.

Name of Co., with amount of issued capital, exclusive of preference and debenture stocks.	Anglo-American Co. £7,000,000.	Brazilian Sub. Co. £1,300,000.	Cuba Sub. Co. £160,000.	Direct Spanish Co. £116,379.	Direct U.S. Co. £1,102,420.	Eastern Co. £3,697,000.	Eastern Ex. Co. £1,997,500.	Gt. Northern Co. £1,500,000.	Indo-Euro. Co. £425,000.	Submarine Co. £338,225.	West Coast America Co. £300,000.	Western and Brazilian Co. £1,398,200	West India Co. £883,210.
	£	£	£	£	£	£	£	£	£	£	£	£ b	£
October, 1878 ...	54,150	13,138	2,800*	1,107	18,050*	41,678	23,393	19,737	... ...	10,689	2,750	... ...	5,143*
October, 1877 ...	49,510	11,387	2,933	914	13,486	37,402	21,388	21,210	... ...	10,823	2,225	10,037	4,563
Increase	4,640	1,751	... ...	193	4,564	4,276	2,005	... ...	... ...	... ...	525	... ...	580
Decrease	... ...	... ...	133	... ...	... ...	... ...	... ...	1,473	... ...	134	... ...	... ...	... ...

* Estimated. b Not published.

(The figures in this Table are as accurate as it is in our power to make them, but we do not guarantee their correctness.)